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Toshimasa TANAI*: A bracket fungus from the Miocene, west of Kobe City, western Japan

棚井敏雅*: 神戸市付近の中新統産サルノコシカケ科化石

(Pl. I-II)

In the long history of fungi ranging from the Precambrian to the Recent, the club fungi (Basidiomycetes) are an extremely successful and heterogeneous group of fungi. Fossils have been recorded from the Upper Carboniferous to the Pleistocene; they are represented commonly by septate filaments or club-shaped cells that are attached to the surface of leaf remains. The fruit bodies such as mushrooms and puffballs have been uncommon in the fossil records, because they easily decay during the sedimentation. Most of the previously-described fruit body fossils are represented by the petrified (silicified or calcified) specimens with thick flesh.

Recently a fossil fruit body of a bracket fungus was collected from the Miocene Kobe Group by Mr. Hiroshi Matsuo, who asked me to investigate its taxonomy. This fossil is represented by a coalified compression of a basidiocarp and its counterpart, which are attached to a coalified wood fragment. Although this fossil specimen shows only limited internal morphology and details, its well preserved external characters permit a comparative study with living bracket fungi. The present specimen represents the first discovery of a fossil fungal fruit body in Japan, although minute fungal remains on fossil leaves or shoots have been described from the Upper Cretaceous (Suzuki 1910, Stopes & Fujii 1910) and the Upper Tertiary (Nathorst 1883, Doi 1983, Doi & Uemura 1985).

Parapolyporites Tanai, gen. nov. (Polyporaceae, Basidiomycetes)

Type species: *Parapolyporites japonica* Tanai

Description: Pileus thin, dorsiventral, semi-circular in shape; stipe absent; flesh thinning toward entire margin; upper surface of pileus dense, with concentric sulcation and radial grooves; hymenophore pore rounded, minute, and separated by thin, smooth dissepiment.

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Parapolyporites japonica Tanai, sp. nov. (Pl. I, 1-3; Pl. II, 1,2)

Type: Holotype, NSM-PP 16702. Myodani, Suma-ku, Kobe City, West Japan. Aina Formation of the Kobe Group (Middle Miocene).

Discription: Pileus dorsiventral, semicircular in general outline, somewhat irregularly folded, 3.5 cm high and 5.4 cm wide, very thin, about 1 mm in thickness, composed of coalified tissue; flesh thinning toward margin that is nearly entire but slightly undulate. Upper surface of pileus marked by dense, concentric sulcation and weak radial grooves. Hymenophore consisting of layers of minute tubes, which are 0.8 to 1 mm long; pores rounded, 0.13 to 0.18 mm in diameter, densely arranged, 5 to 7 per 1 linear mm; dissepiment thin, entire; cystida and setae absent; basidia and spores not preserved.

The compression to fossilize the original basidiocarp resulted in the partial collapse of the hymenophore, revealing the layers of minute tubes. The undersurface of the pileus reflects the concentrically sulcate pattern of the upper surface. This fossil specimen is doubtlessly referable to the family Polyporaceae in having a semicircular, dorsiventral pileus provided with dense concentric sulcation. The direct attachment of the pileus to the substrate without a stipe is similar to the morphology of several extant species of the Polyporaceae, e.g. *Coriolus hirsuta* (Wulf. ex Fr.) Quél. and *C. versicolor* (L. ex Fr.) Quél., both of which are widely distributed in the world.

The comparison of characters between the fossil and these extant species is shown in Tab. 1. Both the living species are generally larger in pore size than the fossil. Except for somewhat larger pores, *C. versicolor* closely resembles the fossil in the thin pileus, the length of minute tube, and the thin dissepiment. The dissepiment of *C. versicolor*, however, is somewhat dentate (Pl. II, 6), while that of the fossil seems to be smooth. On the other hand, *C. hirsuta* is thicker in the pileus, larger in the tube diameter and thicker in the dissepiment than the fossil.

Microporus species, in particular the extant species *M. affinis* (Blu. et Nees ex Fr.) Kuntze and *M. subaffinis* (Llyod) Imazeki, resemble the fossil in question also. Of these two species, *M. affinis* shows more close resemblance to the fossil in having a thin pileus, smaller pores and smooth dissepiment (Pl. II, 4), although the dissepiment is somewhat thicker. These two extant species of *Microporus*, however, are clearly distinguishable in having a short stipe from the fossil basidiocarp here discussed. So far as compared with the extant

Tab. 1. Comparison of some characters between the fossil and similar extant bracket fungi.

Species	Pileus thickness (mm)	Pileus stipe	Length of tube (mm)	Pore number /mm	Pore shape	Dissepiment of hymenophore
Parapolyporites japonica	1+α	absent	0.8-1	5-6	circular	thin, entire
Coriolus versicolor	1-3	absent	1-2	3-5	sided-circular	thin, slightly dentate
Coriolus hirsuta	2-10	absent	1-4	3-4	circular-polygonal	somewhat thick, smooth
Microporus affinis	1.5-3	shortly stalked	1±	6-7	circular	somewhat thick, nearly smooth
Microporus subaffinis	3-10	shortly stalked	2-4	5-6	circular	thin, dentate

species, there is no extant genus of the Polyporaceae to which the present fossil specimen is referable.

A number of fossil polypores have been described by various authors from the Upper Carboniferous to the Pleistocene of the world, although some of them are dubious in their taxonomy (Tiffney & Barghoorn 1974). Of these fossil Polyporaceae, the present specimen is easily distinguishable from forms with a very thick pileus which were described under generic names such as *Phellinites* (Singer & Archangelsky 1958), *Trametites* (Conwetz 1890, Straus 1950) and *Fomes* (Brown 1940, Skirgiello 1960). Although the fossils described as *Polyporites* or *Polyporus* have either thin or thick pileus, the present specimen here described seems similar in general character to some species of *Polyporites*, for instance, *P. sequoiae* Heer from the Tertiary of Greenland (Heer 1874).

From the above comparison, one may conclude that the present fossil specimen is doubtlessly referable to the Polyporaceae. It is impossible to refer the fossil to an extant genus because of the lack of definite taxonomic characters. Thus, it may be better treated as a species of the form-genus *Polyporites*. The genus *Polyporites* was established by Lindley & Hutton (1833) on the basis of two specimens from the Upper Carboniferous of England. These original specimens are similar to the basidiocarp of the Polyporaceae; especially one of them (Lindley & Hutton 1833, Pl. 65, fig. A) bears concentric sulcation on the surface of pileus and minutely porous hymenophore-like structure on the undersurface, and it looks like a thin, non-stalked pileus of the Polyporaceae. However, another specimen (Pl. 65, fig. B) is somewhat different in sulcation and undersurface feature, and seems to be the scale of a fish or of some great saurian reptile as described by Lindley & Hutton (1833).

Thus, it is dubious whether the original specimens of *Polyporites* truly represent a basidiocarp of the Polyporaceae. Accordingly, although the present fossil of the Polyporaceae shows a close superficial similarity to one of the original specimens of *Polyporites*, I consider the generic name suspect at present. Thus, I propose here a new genus, *Parapolyporites*, on the basis of the present specimen which is described above.

It is difficult to identify the host tree to which the present fossil basidocarp is attached, because the host wood is only a carbonized fragment. This fossil was accompanied by fossil leaves of *Quercus* (evergreen and deciduous), the Lauraceae (*Cinnamomum, Lindera, Parabenzoin, Persea*), *Liquidambar, Corylopsis* and *Hedera*. The fossil leaf-flora of the Middle Miocene Kobe Group was described in detail by Hori (1976), based on the extensive collection. In addition to the above genera, he described leaves of many warm-temerate trees such as *Trachycarpus*, evergreen *Ficus, Aleurites, Mallotus, Camellia, Szygium* and *Paulownia*. The floristic composition of the Kobe Group shows a warm-temprate or rather subtropical aspect, although a number of deciduous temperate trees such as *Acer, Alnus, Carpinus, Fagus, Ulmus* and others are included. Accordingly, it is suggested that the present bracket fungus inhabited under the warm-temperate climate.

I heartily thank Dr. Y. Doi of National Science Museum, Tokyo for his kind permission to investigate the extant specimens of the Museum collection for comparison. Cordial thanks are also due to Drs. K. Aoshima and Y. Abe of Forestry Experiment Station at Tsukuba, and Prof. T. Igarashi of Department of Forestry, Hokkaido University at Sapporo, all of those mycologists gave me their kind suggestions in identification of the fossil. I thank also Mr. Hiroshi Matsuo at Kobe for offering me this valuable specimen for my study. This specimen described here was donated by H. Matsuo to be registered in the paleobotanical collection in National Science Museum. I am grateful to Dr. B. H. Tiffney of Department of Biology, Yale University for his kind review of this manuscript.

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Explanation of Plate I-II

Plate I. *Parapolyporites japonica* Tanai. 1: The basidiocarp attached to a coalified wood fragment. Holotype, NSM-PP 16702. ×1. 2: The counterpart of the holotype. ×1. 3: The enlargment figure of the holotype showing the hymenophore pores (arrow-A) and depressed layer of tubes (arrow-B). ×5.

Plate II. Hymenophore pores or layers of tubes. 1, 2: *Parapolyporites japonica* Tanai. Holotype. 1: hymenophore pore, 2: layers of tubes. 3: *Microporus subaffinis* (Llyod) Imazeki. TNS collection. 4: *Microporus affinis* (Blu. et Nees ex Fr.) Kuntze. TNS collection. 5: *Coriolus hirsuta* (Wulf. ex Fr.) Quél. TNS collection. 6: *Coriolus versicolor* (L. ex Fr.) Quél. collected at Hyakunincho, Shinjuku-ku, Tokyo by Doi & Uemura. All ×37.5.

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神戸市北西部（須磨区名谷）付近の中新統中部から，松尾裕司氏によって採集されたキノコ化石を検討した。この化石は半円形子実体の炭化標本で，無茎，表面に円心状の環紋と放射状の浅い皺を有する。子実層托は極めて薄く，管孔状，管孔は円形，孔縁はほぼ平滑である。これらの特徴からこの化石はサルノコシカケ科に属すると考えられ，カワラタケ属およびツヤウチワタケ属のある現生種と共通した特徴をもっている。しかし，子実体の内部構造の詳細は不明であるので現生属には同定できない。また，世界各地から従来報告されたサルノコシカケ科化石の大半とは子実層托が極めて薄い点で異なるが，グリーンランド第三系から *Polyporites* として報告されたものにやや似ている。しかしこの形態属の原記載標本（英国の石炭系産）はキノコ化石であるかどうか疑わしいので，神戸産の化石は新形態属 *Parapolyporites* として記載した。

○本誌62巻1-3号の表紙に掲げたギンバイソウの花式図の解説（山崎　敬）

Takasi YAMAZAKI: Note on the floral diagram of *Deinanthe bifida* Maxim. printed on the front cover of this Journal, vol. 62, nos. 1-3

子房は下位，5枚の心皮からなる。雄しべは約350本，花糸は萼筒に合着し，その維管束は10束に分かれ，花弁と対をなす5束の維管束はそれぞれ25-30本からなり花弁の中脈から分岐し，萼と対をなす5束の維管束は30-40本からなり萼の中脈から分岐する。萼と対をなす束のほうが，花弁と対のものよりやや早く分岐する。

The ovary is inferior and consists of five fused carpels. The five placentae have many ovules. The stamens are about 350 and attached on the calyx-tube. The stamen bundles are arranged in ten fascicles, in which the five antipetalous ones with 25-30 bundles fuse to the petal median bundles and the five antisepalous ones with 30-40 bundles fuse to the sepal median bundles. The branching of the sepal median bundles into the staminal branches takes place slightly ealier than that of the petal median bundles. (東京大学 理学部附属植物園)

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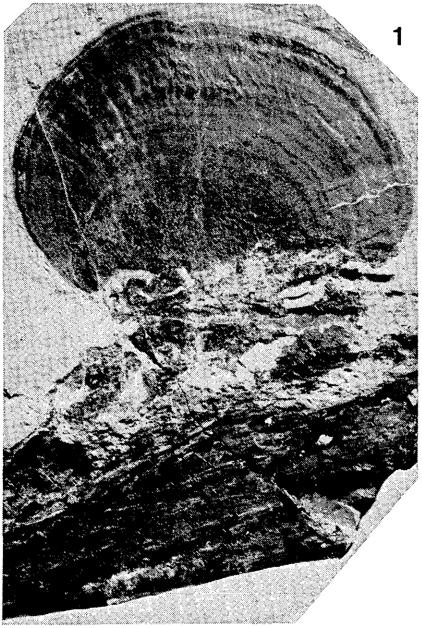

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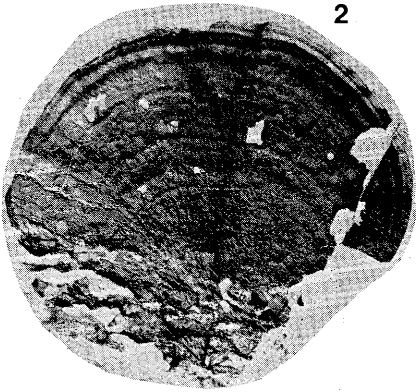

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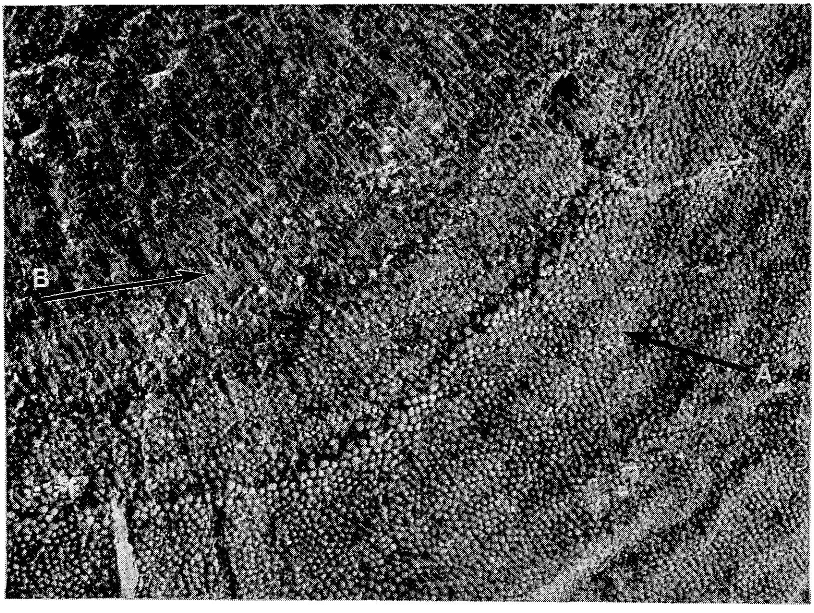

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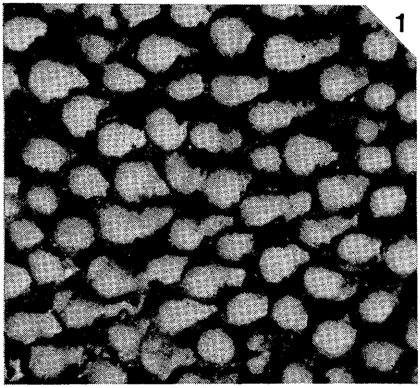
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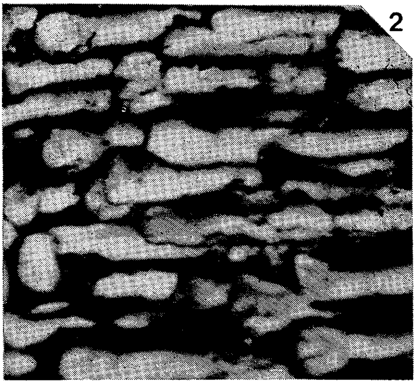
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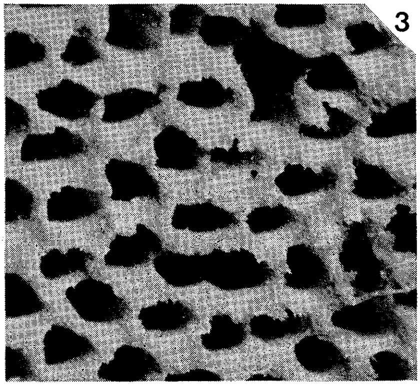
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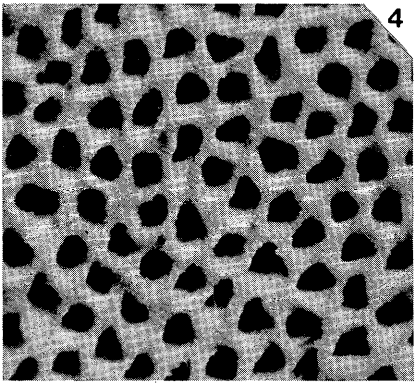
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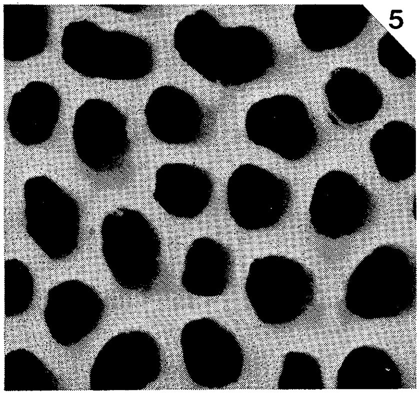
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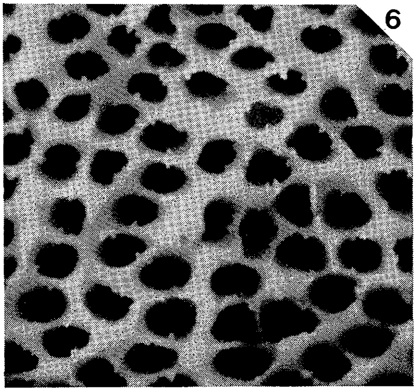
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